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DOCTOR WILLIAM H. WELCH.[1] 1850-1934

By Dr. SIMON FLEXNER

ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH

No greater honor could be paid a pupil of Doctor Welch than the invitation extended to me to take part in these exercises in memory of Doctor Welch. The honor is, however, attended on my part by a feeling of uncertainty and even embarrassment in speaking of Doctor Welch's many-sided nature before an audience made up of his close friends and colleagues. Doctor Welch spent fifty years in your midst; he reached the full development of his extraordinary powers among you; and he became the leading citizen of Maryland, guiding and participating in the beneficent undertakings which have taken place in the state during much of that time.

Doctor Welch's merits could not long remain concealed. Modest beyond most men in his opinion of himself, he soon became a national and then an international figure, exercised an amazing influence in raising the standards and proficiency of higher education; and, having happily been granted length of life beyond the ordinary, he was fêted and celebrated on at least three memorable occasions: in Baltimore on his sixtieth and seventieth birthdays, and in Washington on his eightieth birthday.

The last occasion was unique in the history of tributes paid to a scientist. I need not remind you

[1] An address delivered at the memorial meeting to Doctor Welch held at the University Club, Baltimore, on May 22, 1934. Doctor Welch was born at Norfolk, Connecticut, on April 8, 1850, and died in the Johns Hopkins Hospital, Baltimore, on April 30, 1934. A biographical sketch of Doctor Welch, by the author, is included in "Papers and Addresses," published on his 70th birthday, in 1920. It may be consulted for a fuller and more systematic account of the main incidents of Doctor Welch's professional life. The sketch was reprinted in SCIENCE, 1920, Vol. lii, 417. A brief summary is also available in "American Men of Science," 5th edition, 1933.

that the President of the United States took part in it, nor that coincident celebrations were held in many important centers of science in this country, Europe and even Asia. The addresses of the President and of Doctor Welch were carried by radio throughout the world; and not only in many cities in the United States, but in England, France, Germany, in Peiping and Tokyo, their voices were heard by many hundreds of friends and admirers to whom Doctor Welch's utterances came as the words of a great seer in medical science.

Doctor Welch's half century of eventful scientific life at Johns Hopkins University may be divided into three main periods: the first covered thirty years, during which he was professor of pathology. The other two periods covered ten years each, during the first of which he was director of the School of Hygiene and Public Health, and during the second, director of the Institute of the History of Medicine. In all three of these significant undertakings he was a pioneer, both creating the opportunities and showing the way in which they could best be used.

Before Doctor Welch became professor of pathology in 1884, that subject was in a rudimentary state in this country. Within amazingly few years it had become the strong corner stone of modern medicine in the United States, which was so soon to bring scientific achievement to attract the attention, and arouse the wonder, of Europe. In one of Doctor Welch's notable early addresses I have chanced upon a paragraph of which there is time to give only a brief abstract. Asked by a distinguished German professor of physiology what became of the young men from America who worked in the medical laboratories and who after their return were no more heard of, Doctor Welch replied that encouragement, facilities for scientific work and careers were so limited that the impetus to a continuation of the work was almost wholly lacking. The reply of the professor was: "When America does wake up to the necessity of these things, then let Europe look to its laurels." I think I could make a shrewd guess as to the identity of the German physiologist; and I can readily understand that with two such able, recent pupils as Doctors Welch and Mall, the question was a natural one. It becomes historically important, therefore, to recall that the Johns Hopkins University provided the encouragement and facilities which Doctor Welch applied in that early, pregnant period, and also that the success with which pathology was being cultivated in Baltimore soon excited emulation in the leading medical colleges in the United States, so that careers of some magnitude became slowly available.

The great forward step in medical education contemplated in Baltimore with the launching of the Johns Hopkins University and Hospital was taken at historically a most opportune moment. It is to be recalled that Doctor Welch was appointed professor at the university in 1884, and actually was in residence in 1885. Now the years from 1880 to 1890 are referred to by Doctor Welch as being "perhaps the most wonderful decade in the history of medicine." There had been a revolution in medical thought, brought about through the discovery of the agents causing infectious diseases; and those living to-day can hardly realize the enthusiasm and youthful spirit which were stirred by these discoveries, not only among medical men but among the public. Listerism and aseptic surgery soon followed: medical teaching responded to the spirit and necessities of the time, and hence first pathology and then general medicine could not long be delayed in the essential, forward movement.

Doctor Welch, far more than any one else, was responsible for bringing the new pathology to the United States. Within a few years he found notable coadjutors in the first professors of the clinical branches appointed to the hospital—Doctors Osler, Halsted and Kelly. Both before and after the opening of the medical school, scientific medical work went on apace. The Johns Hopkins Hospital and Medical School became world famous almost at once, and Doctor Welch was recognized the world over as the great architect of that remarkable enterprise.

The eminent position so quickly attained by Doctor Welch brought too soon, and doubtless inevitably, a heavy penalty. The thirty years of Doctor Welch's professorate of pathology may be divided into two periods of equal length. Between 1885 and 1900, Doctor Welch was not only the inspiring director of the pathological laboratory, but was himself also the gifted scientific investigator. Before the turn of the century, his attendance at the laboratory had begun to be impaired by the heavy demands made on his time by other institutions seeking his aid in the upward struggle towards better education and research which had then become active in the United States. Doctor Welch's nature was so gracious and his interest so strong that he could not fail to heed these demands; hence, by the time the new century was ushered in, his personally active laboratory career was brought to an end. He remained the life of the laboratory still, influencing successive groups of students, stimulating his colleagues, but for work with his own hands there was no opportunity. There was, however, a compensation, and I believe consolation. Doctor Welch possessed the rare art of making others strong, and it is to be hoped that a realization of this talent may have contributed correspondingly to his enduring happiness, for no one took greater pride in his pupils and their achievements than did Doctor Welch.

There were also other forces at work, of a highly significant nature, to separate Doctor Welch from the

practical work of the laboratory which was so close to his heart. In 1901, the Rockefeller Institute for Medical Research was founded; soon the Carnegie Institution of Washington was endowed; in rapid succession came the board for the suppression of hookworm disease, and many other similar establishments, through which scientific medicine and the fundamental sciences were to be so signally promoted in the United States. Doctor Welch became immediately a main reliance for counsel in all these enterprises. No one could appreciate more than Doctor Welch did the potential value of such institutions to the growth of science in America.

It is an interesting speculation whether, with his encyclopedic knowledge of the history of science, he connected the rise of the independent institutions of scientific research in the late nineteenth and the early twentieth centuries with the founding of the learned societies in Italy, England and France during the seventeenth century. A parallel could be drawn between those two historical events. In both instances, the demands of scientific growth and exploration had outgrown the provisions in the universities. A broader base of operations was demanded; the encroachments upon the time of teachers by enlarging routine duties had become menacing; the requirements in elaborate and expensive apparatus had often exceeded the ability of the universities to supply the need. Hence there arose outside the universities associations of ingenious men which sought to conquer these obstacles. In the later period, the growth of material wealth was such that philanthropists took the place of the free associations of scientists and governments, and independent institutes of research grew apace. No one contributed to this development more than did Doctor Welch, by whom the serious inroads made on his free time were always met graciously; and no one contributed as much in stimulating suggestion as he with his extraordinarily broad and varied scientific knowledge was able to do.

In the Harvey Lecture delivered in 1916, Doctor Welch pointed out that the Rockefeller Institute could not have justified its establishment twenty-five years earlier, because improvements in medical education had to precede the founding of such an institution; and the same may be said with regard to the relation existing between the universities and the corresponding research units in other sciences.

It must remain a question of pure conjecture whether the diversion of Doctor Welch from the laboratory to the wider, general educational influence was a benefit or a misfortune. That Doctor Welch had a gift for scientific investigation and discovery is patent from his work in Germany and during the early Johns Hopkins period.

An effect of his wider influence was the creation of careers for scientifically trained men, the lack of which had kept the United States backward while Europe was advancing rapidly. It is difficult to see how a greater and more important service could have been rendered in this educationally still undeveloped country. And there was no one else who could have accomplished in this respect what Doctor Welch achieved. He fortunately possessed an almost uncanny instinct in selecting permanent assistants who were to arise and come to fill responsible professorships in other institutions. Just as his method of setting gifted young men to work on research problems defied discovery, so his method of picking the "winners" among the young men crowding his laboratory remains a mystery. I have recently questioned him on this point, but without real success. What I discerned was that those who were to seek opportunities elsewhere learned this from him in so considerate and gentle a way that no pain seems ever to have been caused; and I suspect the successful operation was carried through without the victims being actually aware of its intent.

The second main period in Doctor Welch's varied career consisted of the creation of the School of Hygiene and Public Health. The use of the word "creation" is intentional, because up to that time no comprehensive school of the kind existed. Even in England, where "public health" had received the greatest attention, the provisions for teaching and research were fragmentary and haphazard. However, the subject was one to which Doctor Welch had given not a little thought. The claims of and opportunities for preventive work in medicine, in teaching, practise and research aspects had already occupied his mind and been the objects of some of his impressive addresses. The manner in which he projected the new school reproduced remarkably the fundamental theses on the basis of which the Johns Hopkins Medical School itself was founded. One has merely to reread the early addresses published in the third volume of Doctor Welch's collected works, and especially the first address, the title of which is, "On Some of the Humane Aspects of Medical Science," delivered at the tenth anniversary of the Johns Hopkins University in 1886; and also the address given at Yale University in 1888, "Some of the Advantages of the Union of Medical School and University"—in order to discover how wide and deep was Doctor Welch's thinking on preventive medicine already at that time.

And here I will ask your indulgence for a moment for a digression which seems to me chronologically significant. Besides the early emphasis on hygiene as a rewarding field of scientific exploration, there is a reference in this period to the importance of "the study of the history of medicine, a subject which notwithstanding its interest and value is much neglected.

Nothing is more liberalizing and conducive to medical culture than to follow the evolution of medical knowledge." May we not, therefore, in the words of Alfred de Musset say that Doctor Welch's dream of youth came to be realized in mature years? For he produced in Baltimore in the seventh decade of his life a School of Hygiene which has become the model for the world, and in his eighth decade an Institute of the History of Medicine which already has no peer in the world.

Although this is neither the time nor the occasion for a detailed account of Doctor Welch's technical productions or his general addresses and papers which reveal the extraordinary breadth and depth of his learning, yet before an assemblage at the University Club, of which he was president for so many years, a brief reference to them may be permissible. Doctor Welch gave so much the impression of leisure that the number and nature of his published works may easily excite surprise. And this would be even more the case if it were known how great was the meticulous care and how exhaustive were the efforts put into the experimental and investigative parts of his life work. Problems would be studied for months, even years, before any publication whatever of the results was made; and among his papers are articles which entailed profound and prolonged thought, or literary or historical research of wide scope.

It may be doubted whether before Doctor Welch's time any one claimed for pathology as he did that it is in itself a science, "independent of any practical or useful application whatever, and as legitimate and worthy an object of pursuit as any of the natural sciences." This pronouncement, made in 1889, was established beyond peradventure in 1897, when, as president of the Congress of American Physicians and Surgeons, he spoke on "Adaptation in Pathological Processes." This essay remains to-day a most enlightening treatise on the general biological significance and implications of the manner in which the living body reacts to injury and disease. The range of the observations cited, the interpretation of the processes described, are astonishing and bewildering almost in their fundamental significance. And alongside this classical paper is to be placed the address recently reprinted so delightfully as the first publication of the Welch Bibliophilic Society on, "The Interdependence of Medicine with Other Sciences of Nature." In a visit to Doctor Welch a few weeks before his death, I spoke with him of this lovely, small volume, and he was uncertain whether the address on adaptation might not have been better chosen. Both addresses are so intrinsically interesting and valuable, yet so different, that I can imagine even his choice changing from day to day. In the reprinted address one will find an account of the historical development and interrelation of the medical and other sciences, which exhibits the broadest knowledge and deepest culture; and ignorant as I am of the literature on the history of medicine, I venture to question whether a more fascinatingly readable and informing essay on the rise and counter influences of scientific discovery has ever been written. It must have been a sympathetic labor of love to Doctor Welch merely to compile the data, since medicine as a discipline for the pursuit of science shines out so dazzlingly. For does he not record that, "I have collected, without pretense to exhaustiveness, the names of over a hundred physicians or men trained for the practise of medicine or pharmacy who have made contributions to physics sufficiently notable to secure them a place in the history and records of this science."

Not a few of those of you here present to-night must have seen the film picture made of Doctor Welch within two years of his death, and some of you may recall one of the opening paragraphs of that precious record, in which Doctor Welch says, "Success is so largely dependent on opportunity, and opportunity upon chance, that I count myself fortunate in both regards—fortunate that in my student and early graduate days my special interests should have turned to those subjects, pathology and bacteriology, which were destined to play so important a part in the transformation of the science and art of medicine; and fortunate that in the pursuit of these studies I came under the influence of such masters. . . ."

I need not recall more of this perfect valedictory; there is no word of it which one could wish changed or spare to-day. And it is some consolation for the inestimable loss we have all suffered that this film, which reproduces in a lifelike manner the imposing figure of Doctor Welch and even reproduces acceptably the delightful quality of his voice, is preserved for posterity.

I have occasionally heard Doctor Welch speak on the question often raised, of whether one would relive a long life. His answer consisted of a quotation from Lord Haldane's biography, which expressed his own sentiments. Lord Haldane writes: "A distinguished living statesman and man of the world once asked me whether, even with the aid of such knowledge as experience had brought, I should like to begin life anew. My answer was in the negative. For, I added, we are apt greatly to underrate the part which accident and good luck have really played in the shaping of our careers and in giving us such success as we have had." "And," Doctor Welch would add, "I could not hope again to find the friends, associates, pupils, who have played so large and significant a part in my life and contributed so much to my success and happiness."

And yet, in the last paragraph of Doctor Welch's

film address he says, "Among the many thoughts which occur to one who has lived through the last sixty years of marvelous progress in preventive and curative medicine, one which comes to me forcibly at this moment is that, while the general direction of advancement may be foreseen, the particular lines opened by new discoveries are quite unpredictable, as may be illustrated in the fields of biophysics, biochemistry, immunity and virus diseases. I wish that I could return after another half century and see what is disclosed when the curtain has been lifted from mysteries which now lie hidden in these fields. It is certain that the prospect will surpass all that we can conceive or imagine, and that the power of man over disease will be greatly increased."

Here, it will be noted, Doctor Welch was expressing the insatiable interest and curiosity about disease which was the main passion of his life, and was in no way thinking of himself in any social relation to life whatsoever.

Doctor Welch's hospital year was turned by him, through the extraordinary dignity and impersonality of his demeanor, into a kind of apotheosis of his life. We may all be immeasurably grateful that he was spared prolonged suffering; the discomforts of his illness he bore with uncomplaining fortitude. His brilliant and powerful mental faculties were undimmed until just before the end, so that parts of each day, almost, could be given over to visits from friends and colleagues, which to them were occasions and unfailing and unforgetable delight. Doctor Welch's mind roamed widely over historical, literary, scientific and personal events; and not the least loss of perspicuity or memory or interest was ever detectable. He remained the omnivorous reader of long-established habit, and his interest in current biographies was never livelier than during this year. These books stimulated his memory, added to his already prodigious stores and provided exciting topics of conversation in which the rich resources of his seventy years of reading never appeared to better advantage. There must have been hours of weariness or discomfort or sleeplessness; these he beguiled with mystery stories of which, like his eminent fellow student of German university days, Paul Ehrlich, there could never be a surfeit. In this last period he continued to manifest a keen interest in the educational and philanthropic enterprises in which his wise counsel had been so great a boon; but what appeared most remarkable and touching was his undiminished personal affection for those to whom he was increasingly near and dear.

EXILES IN BRITISH SANCTUARY[1]

By LORD RUTHERFORD OF NELSON

IN the conviction that the universities form a kingdom of their own, whose intellectual autonomy must be preserved, my distinguished colleagues formed the Academic Assistance Council one year ago and the Royal Society provided accommodation for the council's offices. The occasion was the displacement of our fellow scientists and scholars from their university positions in Germany; but the problem with which the council is faced is wider and deeper than that presented by the need for assisting these German teachers. Its ambition is to defend the principle of academic freedom and to help those scholars and scientists of any nationality who on grounds of religion, race or political opinion are prevented from continuing their work in their own country.

The series of political revolutions in Europe since the great war has created a large body of wandering scholars; many, for instance, among the Russian and Italian *emigrés* have unfortunately through the absence of organized assistance by their university colleagues lost the means of continuing their scientific careers. But there are many whose talent and experience could still be effectively used, and their number has been tragically swollen during the past year by the expulsion from academic positions in Germany of persons possessing pacifist or internationalist convictions or lacking that strangest of qualifications for the life of scholarship, "Aryan" genealogies.

To incorporate the services of these wandering scholars in the other universities of the civilized world is more difficult to-day than in the Middle Ages when the "communities of learners" were less hampered by administrative formalities, restrictive endowments and incipient nationalist tendencies. Medieval scholars could migrate to other districts and the "universitas" moved with them; the same catholicity of spirit has been fortified by the present crisis in both our ancient and our modern universities.

The universities of Great Britain have responded generously to the council's suggestion of inviting the displaced scholars to work as research guests; hospitality has thus been extended in this country to 178 of our university colleagues. The multicellular London University has received 67; Cambridge University has not only given hospitality to 31, but its individual colleges have contributed over £1,000 to the council's funds: Oxford University has welcomed 17 guests;

[1] The London *Times*.

Manchester University has invited 16, and by local efforts raised a special fund for their support. Almost all other universities and university colleges in Great Britain have opened their common-rooms, libraries and laboratories to temporary research guests, and several have raised local assistance funds. The British university teachers have contributed liberally to the Academic Assistance Council, and the staff at the London School of Economics have taxed themselves voluntarily of a percentage of their salaries for three years.

In spite of this encouraging support from the universities, the council's work has been seriously hampered by lack of funds. The council has received slightly more than £13,000 during its first year, including a grant of £2,500 from the Central British Fund for German Jewry. Almost all that sum has now been expended in maintenance grants to displaced scholars within Great Britain or the British Empire, at the rate of £182 per annum for a single person and £250 for married persons. The council is therefore not able to give assistance to many distinguished university teachers who are now faced with destitution and the abandonment of their scientific careers, and, what is more serious, it will not be able to renew its research grants for a second year to the scholars in England, and will then have to abandon them in a world where even the opportunities of temporary refuge are contracting. Only if it uses funds not otherwise available for the British Universities can the council avoid injuring the economic interests of the university teachers of this country, or weakening that great body of sympathy in the colleges which is the inspiration of its activity and the condition of its success.

Although prevented by lack of financial resources from doing as effective work as it could, the council has been able to assist the continuation of research work of great importance. In the annual report of the council, issued to-day, records of the work of the scholars and scientists in this country show they made several notable discoveries, even during the short period of their residence as guests.

The council has received gratifying reports of the excellent results of this collaboration between English and German colleagues both in scientific and literary subjects and also in the arts. Indeed, the opportunity of productively organizing group schemes of research both in the natural sciences and in the social sciences (for instance, in comparative law) with the services of distinguished German scholars is one that only lack of funds has hindered the council from using.

Temporary subsidies for maintenance and research, however, form only the emergency policy of the council. Temporary fellowships are useful in saving the scholars from scientific sterility, in giving them the opportunity of strengthening their qualifications by further publication and the acquisition of new languages, and in giving them the active cooperation of their colleagues in discovering permanent positions; but they are justified only in so far as they assist to self-supporting existence once more.

The council, in cooperation with other committees and organizations, is conducting a world-wide survey to discover openings in which the services of our colleagues can be used again. The reorganization of the University of Istanbul, which has provided posts for more than 30, the formation of the "University of Exile" in New York, and the projects for the reorganization, expansion or creation of university institutions in Russia, Persia and Brazil show that group settlement is possible: but the bigger part of the permanent solution depends on the individual placement of persons in appropriate situations without injuring the professional or economic interests of other university teachers, research workers or graduates. The council is in active communication with correspondents and investigators in various parts of the British Empire, Russia, China, Japan, South America and other countries, and has received many invitations which will lead to the permanent absorption of several scholars and scientists. It believes that as the academic distinction and scientific qualifications of the wandering scholars become known, the problem will solve itself. The great need is to maintain our colleagues for the next two years in research positions which will allow them to preserve their scientific equipment while this process of diffusion and absorption takes place.

The council is grappling with an intricate problem. In Germany 1,202 university teachers have been displaced; so far only 389 are known to have found even temporary places elsewhere, and of these 178 have found academic refuge in this country. The council is not merely a relief organization striving to save the scientists displaced by political revolutions, for, in the middle of one of the greatest crises in the history of the universities, it is determined to preserve a respect for the basic traditions of academic freedom, the security of learning and the integrity of science.

The council feels that it has made a successful start in its work, and is deeply encouraged by the magnificent response from the British universities. It is convinced that it will receive from a wider public than the academic the sympathy and financial support without which its achievements will be frustrated, but with which the international authority of science will be demonstrated, the British nation will have proved its loyalty to its proud heritage of toleration, and academic freedom will have been strengthened against the perils which beset it in so many parts of the world.

SCIENTIFIC EVENTS

JOINT EXPEDITION TO BRITISH INDIA

AN expedition in the high mountain country north of Cashmir, British India, to study the mechanism and effects of adaptation and acclimatization of man and animals to life at high altitudes, is being organized by Harvard University, with the cooperation of Cambridge University, England, and the University of Copenhagen, Denmark. The field work will be carried on for five months in the spring and summer of 1935, from a base camp at 17,500 feet in the Kolumpa Valley, near Leh, in the Himalayas. The expedition is being financed by the universities and by scientific foundations here and abroad.

The Fatigue Laboratory of Harvard is directing the enterprise. Members of the expedition will be Dr. Ancel Keys, of the Fatigue Laboratory, head of the party; E. Hohwü Christensen, laboratory of zoophysiology, University of Copenhagen; Gordon Bowles, department of anthropology, Harvard University; Harold T. Edwards and William Hathaway Forbes, Fatigue Laboratory; Bryan H. C. Matthews, King's College, University of Cambridge, and John H. Talbott, department of medicine, Harvard University. Cooperating work will be undertaken by David Bruce Dill in the Fatigue Laboratory.

Scientific apparatus will be taken that will permit a detailed study of the respiration, circulation, metabolism, acid-base balance, water balance, heat regulation, cardiac performance, excretion, blood gas transport and subjective responses in rest and in work of varying intensity. Continuous observations will be made, but especially detailed programmes will be carried out at sea level, 5,000 feet, 11,000 feet, 14,500 feet, 17,500 feet, 19,500 feet and the same stations coming down. The base camp will be a short distance from the famous Turkestan-Cashmir caravan route, the highest road in the world regularly traversed by man. This road has three passes at about 18,000 feet and three other passes at more than 18,000 feet.

The expedition will study the natives who live in such altitudes. The snow line is at about 18,000 feet here. Grazing is carried on to 17,000 feet, and the natives drive their flocks as high as 18,000 feet. There are a few settlements at 16,500 feet. One monastery is at 16,000 feet, a nunnery at 17,000 and a hermit lives at 18,000 feet.

Arthropological studies of the natives will be made by Mr. Bowles in the Ladak country, in which the base camp will be located. The people are known as Ladaki, and are almost entirely of Tibetan stock. They are Lama Buddhists in religion. The famed Cashmir wool comes from Ladak. The expedition will go from Srinagar, a city of 150,000 in the Vale of Cashmir, up to the base camp, a distance of about 300 miles by caravan.

The only other comparable studies of high altitudes by scientific expeditions were at Cerro De Pasco, in Peru, 22 days at 14,500 feet; Pike's Peak, 7 days at 14,108 feet; Mt. Massive, Colo., 3 days at 14,400 feet, and Mt. Rosa, Italian Alps, overnight at 15,000 feet. N. E. Odell, British geologist, spent nine days at 23,000 feet on Mt. Everest. The highest peak ever climbed was Mt. Kamet, 25,400 feet, in British India, three years ago, by an expedition under F. S. Smythe.

The advisers to the expedition are: Professor Joseph Barcroft, the University of Cambridge; Dr. Hellmut De Terra, Yale University; Professor Lawrence J. Henderson, Harvard University; Professor E. A. Hooton, Harvard University; Professor August Krogh, Copenhagen University; Professor Alfred Redfield, Harvard University; Dr. Donald D. Van Slyke, the Rockefeller Institute.

THE AMERICAN DAIRY SCIENCE ASSOCIATION AND THE GENEVA STATE EXPERIMENT STATION

THE annual meeting of the American Dairy Science Association will be held in Ithaca and Geneva, from June 26 to 28. It is expected that investigators from all sections of the United States and Canada will attend. Babcock, Sturtevant, Wing, Van Slyke, Jordan, George A. Smith and others carried forward their researches in the field of dairy research at the Geneva station. While some of the early workers in dairy science at Geneva moved to other institutions to complete their life work, much of the early dairy research carried on at the Experiment Station still stands as a foundation for later investigations.

One of the early undertakings of Dr. E. L. Sturtevant, first director of the station, was to assemble on the station grounds representatives of the different breeds of dairy cattle for a comparison of their value as milk animals. This was a unique experiment at the time and formed for some time the basis of recommendations for the selection of dairy cows.

Dr. S. M. Babcock was the first chemist to be employed at the Experiment Station. He later moved to Wisconsin where he perfected the method for measuring the butter fat content of milk that now bears his name. It remained for his successor at Geneva, Dr. L. L. Van Slyke, to introduce the Babcock method to New York dairy farmers and to demonstrate to them that it was practical and that it safeguarded their interests. Dr. Van Slyke also made contributions to the chemistry of milk and of cheese in addition to making other researches of value to agriculture.

George A. Smith, for many years head of the Dairy Division at the Experiment Station, was instrumental in building up the present herd and made important contributions to the cheese industry of the state.

Dr. W. H. Jordan, director of the station from 1896 to 1921, carried on experiments in animal nutrition that laid the groundwork for much of the later research conducted in this field. In recent years, dairy research at Geneva has centered around dairy manufactures, notably ice cream and cheese, the creaming of milk, sanitary milk production in its many phases, the detection and control of mastitis and chemical studies relating to milk. In addition to research much service work is carried on, including the inspection of all the glassware used in the state for testing milk and cream for butter fat and for making bacteriological tests of milk.

THE CALIFORNIA MEETING OF THE AMERICAN PHYSICAL SOCIETY

THE 192nd regular meeting of the American Physical Society will be held in Le Conte Hall, University of California, on Tuesday, Wednesday, Thursday, Friday and Saturday, June 19–23, in affiliation with Section B of the American Association for the Advancement of Science. An informal dinner has been arranged for Wednesday, June 20, at the faculty club.

In addition to the regular program of papers three symposia have been arranged as follows:

JOINT MEETING WITH THE ASTRONOMICAL SOCIETY OF THE PACIFIC

Symposium on Spectroscopy in Astrophysics

1. Tuesday, June 19, at 10:00 A.M.

"Unidentified Interstellar Lines," Dr. Paul W. Merrill, Mount Wilson Solar Observatory.

"Diffraction Gratings and their Applications to Astronomical Problems," Professor R. W. Wood, the Johns Hopkins University, vice-president of American Physical Society.

2. Tuesday, June 19, at 2:00 P.M.

"Light of the Night Sky," Professor Joseph Kaplan, University of California at Los Angeles.

"Spectroscopic Evidence of Galactic Absorption," Dr. R. J. Trumpler, Lick Observatory.

"Forbidden Lines in Astronomical Sources," Professor I. S. Bowen, California Institute of Technology.

Symposium on Nuclear Structure

1. Wednesday, June 20, at 9:30 A.M.

"The Production of High Voltage and Its Application to Nuclear Research," Professor R. J. Van de Graaf, Massachusetts Institute of Technology.

"Disintegration Experiments Using Protons and Deutons at 1,200 Kilovolts," Dr. Merle A. Tuve, Department of Terrestrial Magnetism, Carnegie Institution.

"Recent Nuclear Investigations at the University of California," Professor E. O. Lawrence, University of California.

2. Wednesday, June 20, at 2:00 P.M.

"The Emission of Neutrons and Gamma Rays from Various Elements," Professor C. C. Lauritsen, California Institute of Technology.

"Disintegrations with Positron Ejection," Professor Carl D. Anderson, California Institute of Technology.

"The Nature of Cosmic Rays," Dr. Thomas H. Johnson, Bartol Research Foundation.

In addition, Professor Felix Bloch, of Stanford University, and Professor J. R. Oppenheimer, of the University of California, have been asked to discuss the papers from the mathematical physical point of view.

Symposium on Fundamental Physical Constants

1. Thursday, June 21, at 10:00 A.M.

"The Value of the Electronic Charge," Professor R. A. Millikan, California Institute of Technology.

"Measurement of the Compton Shift," Professor P. A. Ross, Stanford University.

"Continuous X-Ray Spectra and the Value of $h/e^{4/3}$," Dr. Paul Kirkpatrick, Stanford University.

"A Measurement of the Compton Shift and the Determination of the Constant h/me," Dr. J. W. M. DuMond, California Institute of Technology.

2. Thursday, June 21, at 2:00 P.M.

"Spectroscopic Determinations of Atomic Constants," Professor W. V. Houston, California Institute of Technology.

"The Present Status of the Values of e, h and e/m," Professor R. T. Birge, University of California.

RECENT DEATHS

THOMAS HUSTON MACBRIDE, president emeritus of the Iowa State University, died after a brief illness at the home of his son in Seattle, Washington, on March 27, in his eighty-sixth year. Besides being an eminent administrator and teacher, he was a distinguished botanist and an authority on the Myxomycetes.

DR. CARL EWALD GRUNSKY, consulting engineer of San Francisco, president of the California Academy of Science, president in 1924 of the American Society of Civil Engineers, known chiefly for his work on the irrigation and drainage problems of California, died on June 9 at the age of seventy-nine years.

THE death is announced of Dr. Carl Arthur Hedblom, since 1926 head of the department of surgery of the Illinois Medical School.

DR. C. FRANCIS JENKINS, inventor of the systems of television and telephotography bearing his name, died on June 6. He was sixty-eight years old.

THE death is announced on May 22 of Dr. Andrew Fullerton, who retired last October from the professorship of surgery at Queen's University, Belfast.

THE death on May 25 is reported of Professor H. G. Chapman, director of cancer research at the University of Sydney, Australia.

SCIENTIFIC NOTES AND NEWS

COLUMBIA UNIVERSITY conferred at commencement the doctorate of science on Dr. Ernest William Brown, emeritus professor of mathematics at Yale University, and on Dr. James Bryant Conant, president of Harvard University.

AT the commencement exercises of Syracuse University the degree of LL.D. was conferred on Dr. Harvey Cushing, Sterling professor of neurology in the Yale School of Medicine, and on Dr. Livingston Farrand, president of Cornell University. The degree of D.Sc. was conferred on Dr. Florence R. Sabin, of the Rockefeller Institute for Medical Research, and on Dr. Ludwig Kast, professor of medicine at the New York Post-Graduate Medical School and president of the Josiah Macy, Jr., Foundation.

AT the seventy-first annual commencement on May 31 Kansas State College conferred the honorary degree of doctor of science upon Professor A. S. Hitchcock, of the U. S. Department of Agriculture, and the honorary degree of doctor of laws upon Professor Martin Mortensen, head of the department of dairy industry at the Iowa State College.

HONORARY degrees conferred by Stevens Institute of Technology at the sixty-second annual commencement exercises on June 9 were the doctorate of science on Dr. James Bryant Conant, president of Harvard University; the doctorate of engineering on William Hovgaard, professor of naval design and construction at the Massachusetts Institute of Technology; on William Slocum Barstow, electrical engineer, New York City; on William Duane Ennis, professor of the economics of engineering on the Stevens faculty; and of mechanical engineering on Harry Ruby Westcott, of New Haven, Connecticut.

THE degree of doctor of laws was conferred by the University of Nebraska at commencement on Dr. Walter B. Pillsbury, professor of psychology at the University of Michigan.

AUGUST MERZ, president of the New Jersey Section of the American Chemical Society, received the honorary degree of doctor of science from Rutgers University on June 6.

JOSEPH L. WHEELER, librarian of the Enoch Pratt Free Library at Baltimore, was awarded the degree of doctor of letters by the University of Maryland on June 2 in recognition of his development of public library service in Baltimore, including its exhibit program and the new Central Library Building. His work is known through the series of 27 science book lists published by a special committee of the American Association for the Advancement of Science, of which he is chairman, and for which he secured the printing funds from the Carnegie Corporation. Over a million copies of these book lists on various scientific subjects have been distributed during the last three years through schools, colleges, museums and natural history organizations.

A DINNER was tendered on May 5 by the University of Michigan Chapter of the Honorary Geological Fraternity of Sigma Gamma Epsilon to Professor William H. Hobbs, who is retiring as head of the department of geology. At this dinner, which was attended by the entire staff of the departments of geology and mineralogy, addresses were made by Dr. Edward H. Kraus, dean of the College of Literature, Science and the Arts; by Professor E. C. Case, who succeeds Professor Hobbs as head of the department; by Dr. Frank Leverett; by representatives of graduate and undergraduate students and by Professor Hobbs. By action of the board of regents, Dr. Hobbs has been made professor emeritus of geology.

THE Gold Medal of the Royal Empire Society has been awarded to Brigadier-General Sir Percy Sykes for his book entitled "A History of Exploration from the Earliest Times to the Present Day."

DR. ROBERT H. IVY, professor of maxillo-facial surgery in the School of Dentistry and in the Graduate School of Medicine of the University of Pennsylvania, has been elected to membership in the Imperial German Academy of Natural Sciences at Halle.

DR. L. P. SIEG, professor of physics, dean of the College and of the Graduate School and acting dean of the School of Education at the University of Pittsburgh, will assume the presidency of the University of Washington, at Seattle, on August 1.

PROMOTIONS at the University of Michigan include in the sciences: Ermine C. Case from professor of historical geology and paleontology, director of Museum of Paleontology and curator of vertebrates to chairman of the department of geology in addition to his other duties mentioned above; George R. La Rue from professor of zoology and executive secretary of the department to chairman of the department of zoology; W. Carl Rufus from assistant to associate professor of astronomy; Dean B. McLaughlin from assistant to associate professor of astronomy; George M. Ehlers from assistant to associate professor of geology; Frank N. Blanchard from assistant to associate professor of zoology; Lee R. Dice, of the museum of zoology, from an assistant to an associate professorship; Carl L. Hubbs, of the museum of zoology, from an assistant to associate professor; Armand J. Eardley from instructor to assistant professor of geology.

AT the seventeenth annual meeting of the American

Society of Ichthyologists and Herpetologists, held recently in New York, the following were elected officers for the ensuing year: Leonhard Stejneger and John T. Nichols, *honorary presidents;* Carl L. Hubbs, *president;* E. W. Gudger, Francis Harper and Clifford Pope, *vice-presidents;* M. Graham Netting, *secretary;* A. W. Henn, *treasurer;* Carl L. Hubbs and Helen T. Gaige, *editors.* The next meeting of the society will be held in Pittsburgh in May, 1935.

OFFICERS of the Minnesota Academy of Science were elected at the second annual meeting as follows: *President,* Dr. T. B. Magath, Mayo Clinic; *Vice-president,* W. A. Kenyon, Hamline University; *Secretary-Treasurer,* H. K. Wilson, University of Minnesota; *Councilors,* Geo. W. Friedrich, St. Cloud Teachers College; Richard U. Jones, Macalester College; Rev. Wendelin Luetmer, St. Johns University, and E. T. Tufte, St. Olaf College.

DR. WILLIAM THOMAS CALMAN, keeper of zoology in the British Museum of Natural History, has been elected president of the Linnean Society, London, in succession to Professor F. E. Weiss.

ON May 4 Evan Williams was reelected for the sixteenth consecutive year to the office of president of the Mining Association of Great Britain.

AT the annual general meeting of the British Institute of Physics, held at the Royal Institution on May 15, the following officers were elected: *President,* Sir Henry Lyons; *Vice-president,* Professor W. L. Bragg; *Honorary Treasurer,* Major C. E. S. Phillips; *Honorary Secretary,* Professor J. A. Crowther; *New Members of the Board,* Dr. Allan Ferguson and Mr. R. S. Whipple.

DR. HOWARD A. EDSON, formerly in charge of the Office of Vegetable and Forage Diseases of the Bureau of Plant Industry and for the past seven years chief examiner of the U. S. Civil Service Commission, has been appointed in the U. S. Department of Agriculture to succeed Dr. Neil E. Stevens in charge of the plant disease survey. Dr. Stevens will continue with the bureau in research on corn diseases.

H. P. BARSS, professor of botany and plant pathologist at the Oregon College and Experiment Station, was recently appointed principal botanist in the Office of Experiment Stations of the U. S. Department of Agriculture.

DR. GARDNER A. NORTON, physicist, recently engaged in special studies at the Cruft Laboratories, of the Engineering School of Harvard University, has joined the staff of Arthur D. Little, Inc., of Cambridge, Massachusetts. He will be in charge of work on the industrial applications of mechanical vibration, sonic energy and electronic devices. Dr. J. Raymond Sanborn, recently of the Research Department of the International Paper Company and formerly in charge of the Bacteriological Department at Macdonald College, McGill University, has also joined the staff. He will be engaged on bacteriological and related investigations, particularly in the food industries.

DR. GUIDO BECK, professor of physics in the German University at Prague, formerly of the University of Vienna and the University of Leipzig, will be a resident professor of physics in the University of Kansas during the year 1934–35, under the auspices of the Emergency Committee in Aid of Displaced German Scholars and of the Rockefeller Foundation. Professor Beck will conduct a seminar on problems of atomic nuclei and a course on the Dirac theory of electrons.

PROFESSOR EARL F. CHURCH, assistant professor of photogrammetry in the College of Applied Science, Syracuse University, has been appointed by Secretary of State Hull one of the two official American delegates to the Fifth International Congress of Surveyors, to be held in London, from July 18 to 21. The establishment in 1929 of the department of aerial photogrammetry was made possible by a grant of $60,000 from the Guggenheim Foundation.

DR. FRED EGGAN, of the department of anthropology of the University of Chicago, sailed on June 1 for the Philippine Islands to study the effects of the white man's material culture upon the tribes of Luzon, the northernmost island of the archipelago. He plans to live for fifteen months in the villages of the Tinguian people.

RECENT visitors at the School of Tropical Medicine, San Juan, Puerto Rico, include Dr. Allen O. Whipple, Valentine Mott professor of surgery of the College of Physicians and Surgeons, Columbia University, who made special investigations in the surgical aspects of tropical diseases, and Dr. William Thompson, of the department of medicine, who has been investigating the hematological aspects of schistosomiasis mansoni. Dr. Louis M. Rousselot, of the department of surgery, is spending six months at the school as an exchange surgeon with Dr. José Noya Benítez, who is now working in the department at Columbia.

DR. JAMES BRYANT CONANT, president of Harvard University, delivered the address to the senior class of Stevens Institute of Technology at the commencement exercises on June 9.

AT the seventy-first annual commencement of Kansas State College at Manhattan on May 31, Dr. W. E. Wickenden, president of Case School of Applied Science, delivered the commencement address on "Making Terms with the Machine."

DR. HENRY B. WARD, permanent secretary of the American Association for the Advancement of Science, was recently the guest speaker at a luncheon of the Sigma Xi Club of the University of Denver. He spoke on "Research, its Requirements and its Value."

DR. JOSEPH BARCROFT, professor of physiology at the University of Cambridge, delivered the Stephen Paget Memorial Lecture at the annual general meeting of the Research Defense Society at the London School of Tropical Medicine and Hygiene on June 5. His subject was "Experiments on Man."

THE Planning Committee for Mineral Policy, which was appointed by President Roosevelt in April, is made up of representatives of the various government agencies having to do with minerals. The purpose is to undertake a general study of the mineral resources of the United States, with a view to the establishment of a national mineral policy. Among the questions to be considered by this committee are the estimating of future consumption, the curtailment of production, the coordination of emergency appropriations, the relationship between federal and state control, the conservation of mineral resources and the effect of mineral tariffs. The members of the committee are: Harold L. Ickes, Secretary of the Interior, *chairman;* C. K. Leith, Science Advisory Board, *vice-chairman;* Herbert Feis, economic adviser, Department of State; Lieut. Col. C. T. Harris, Jr., Office of the Assistant Secretary of War; Leon Henderson, economic adviser, National Industrial Recovery Administration; W. C. Mendenhall, director, U. S. Geological Survey; Scott Turner, director, U. S. Bureau of Mines; F. A. Silcox, chief forester, Forest Service, Department of Agriculture; Wayne C. Taylor, special assistant to the special adviser to the president on foreign trade; Willard L. Thorp, formerly director, Bureau of Foreign and Domestic Commerce, Department of Commerce, and J. W. Furness, chief, Minerals Division, Bureau of Foreign and Domestic Commerce, Department of Commerce.

THE British Institute of Physics plans to arrange a two-day conference at Manchester in the spring of 1935 on the application of x-ray structural analysis to various industries. The main function of the conference will be to bring to the notice of industrialists what physics and physicists can do to help industry, rather than the discussion of technical matters among experts. It is proposed to arrange an exhibition in connection with the conference.

ACCORDING to a wireless message to *The New York Times* an attempt to rise into the stratosphere, financed by the Belgian National Scientific Research Fund, instituted by the late King Albert, will be made from Hour Havanne, in the Ardennes, Belgium, between June 15 and September 30. The balloon is the one used by Professor Auguste Piccard, but the gondola is new, having been constructed at the University of Brussels since the accident when the gondola exploded. Professor Piccard plans to make scientific observations at various altitudes. The gondola will be equipped with wireless apparatus and messages will be in code.

THE Psychological Laboratory and Bantu Study Department of Stellenbosch University, Capetown, were destroyed by fire on May 15. The loss of the Bantu Study Department is said to be especially serious, the extensive library and valuable records being destroyed.

ACCORDING to the *Journal* of the American Medical Association a sum of over $1,000,000, to be used for the benefit of Georgia Warm Springs Foundation, Warm Springs, was presented to President Roosevelt on May 9, in a ceremony in the White House. Of this sum, $100,000 will be used "to stimulate and further the meritorious work being done in the field of infantile paralysis" outside Warm Springs, "so that the greatest encouragement may be given to others interested in this problem." $650,000 will be set aside for "the furtherance of the present work done at Georgia Warm Springs Foundation," of which President Roosevelt is the head and founder, while the balance of $250,000 will be used "for building, maintenance and contingencies of the foundation."

THE Executive Committee of the Board of Trustees of the American Ceramic Society passed on May 4, at the annual meeting in Buffalo, N. Y., the following resolution: WHEREAS, the American Ceramic Society was one of the organizations influential in the establishment of the Bureau of Standards in 1901; and, WHEREAS, the American Ceramic Society has continued its support and its encouragement of the Bureau's activities, especially in the field of fundamental and scientific research; and, WHEREAS, as a consequence of the retrenchment policy of the Federal Government, the activities of the Bureau of Standards have been drastically curtailed to the serious detriment of the science and technology of ceramics and of the several ceramic industries; and, *Be it Resolved,* that the attention of the proper committees and members of Congress be called to this critical situation; and that they be requested when making appropriations for the coming fiscal year to provide adequately for (a) fundamental research at the Bureau of Standards; (b) the maintenance of units and standards of measurement; and (c) research and development in the science of measurement—all of which constitute the foundation stones of science, engineering and the industrial arts.

DISCUSSION

SKIN TEMPERATURE REACTIONS FOLLOWING REMOVAL OF THE LEFT CEREBRAL HEMISPHERE

A RECENT report by Kennard[1] discusses the alterations in skin temperatures following certain lesions in the premotor area of the cerebral cortex. She concluded from observations on subhuman primates, as well as in a case of tumor of the brain, that the premotor area of the cerebral cortex directly influences the autonomic system and in particular the vasomotor mechanism. She noted alterations in skin temperature on the contralateral side of the body as well as alterations in color and texture of the skin.

Following unilateral extirpation of certain portions of the frontal lobe in animals, she found that abrupt cooling gave rise to vasoconstriction, which occurred as in normal animals equally and simultaneously in both feet. Heating gave a vasodilatation which occurred very slowly in the foot opposite to the side of the lesion, whereas the response on the ipsilateral foot was prompt and normal in character.

The following observations on skin temperature reactions were made on a patient following the removal of the entire hemisphere except the basal ganglia. A total of 760 grams of cerebral tissue, including tumor, was removed. At the suggestion of Dr. J. F. Fulton observations were made of the skin temperature reactions of the legs to determine the effect of removal of the hemisphere on the vasomotor response. On the seventh day after left hemispherectomy the patient was placed in a draught-free room with temperature 74° F. and humidity 58 per cent. Skin temperature readings were made on both lower extremities, using the Tycos Dermatherm.[2] The temperatures of both great toes, after exposing the extremities to the room air, were 32.5° C. T. equal on both sides. The same was true of similar corresponding points. There were no evidences of abnormal redness, heat or sweating on the contralateral side.

The forearms of the patient were then placed in hot water at 43° C. and skin temperatures taken on the lower extremities at one-minute intervals over a period of one-half hour (technique of Gibbon and Landis[3]). There was the usual sudden temperature drop averaging 1° C., following the sudden stimulus of placing the forearms into the hot water.[4] The temperature then began to rise in the normal way and reached 35.6° C. on the right and 35.4° C. on the left side (3° rise). Redness and skin texture were equal on both sides, but no sweating was demonstrable. The body temperature rose from 101.6° to 102.2° F. (rectal).

Seven days later, the patient was placed in the same room at 76° F. and 56 per cent. humidity. Initial skin temperatures of the great toe were 31.5° C. on the right and 31.3° C. on the left side. The forearms were then immersed into cold water at 16° C. and temperatures taken at one-minute intervals for thirty minutes. Immediately following immersion of the forearms into cold water there was a generalized vasoconstriction with a fall in temperature of 0.9° C. on both sides. The temperature began rising slowly and reached its maximum of 32.1° C. on the right and 31.7° C. on the left side in seventeen minutes; an average rise of 1.5° C. above the coolest temperature after immersion into cold water. There was a similar rise in body temperature from 101.2° to 101.6° F. (rectal).

These determinations show that in hemispherectomy in the human there appear to be no measurable alterations in peripheral temperature regulation on either the ipsilateral or contralateral side. There were no alterations in either the texture or color of the skin of one side as compared to the other. The variability of corresponding temperatures on either side were within normal limits of fluctuation, based on the studies of many controls.[3,5] The elevations of temperature following immersion into the hot and cold water were normal and designate a normal vasomotor apparatus.

ROBERT ZOLLINGER
MAX T. SCHNITKER

PETER BENT BRIGHAM HOSPITAL
BOSTON, MASSACHUSETTS

[1] Margaret A. Kennard, "Vasomotor Representation in the Cerebral Cortex," SCIENCE, 79: 348–349, 1934.

[2] John J. Morton, and W. J. Merle Scott, "Methods for Estimating Degree of Sympathetic Vasoconstriction in Peripheral Vascular Diseases," *New Eng. Jour. Med.*, 204: 955–962, 1931.

[3] J. H. Gibbon, Jr., and E. M. Landis, "Vasodilatation in Lower Extremities in Response to Immersing Forearms in Warm Water," *Jour. Clin. Investigation*, 11: 1019–1036, 1932.

[4] G. W. Pickering, and W. Hess, "Vasodilatation in the Hands and Feet in Response to Warming the Body," *Clin. Science* (Incorporating *Heart*), 1: 213–223, 1933.

[5] E. C. Cutler and Max T. Schnitker, "Skin Temperature Changes after Total Thyroidectomy," *Jour. Exper. Biol. and Med.*, 31: 736–739, 1934.

INSECT TRANSMISSION EXPERIMENTS WITH HERPES-ENCEPHALITIS VIRUS

IN the September 15, 1933, issue of SCIENCE we published a progress note entitled, "Insect Transmission Experiments with Herpes-Encephalitis Virus," in which we summarized the results obtained in our attempts to transmit three strains of virus through *Aedes aegypti*. The evidence then appeared to war-

rant the following conclusion: "In view of the incidence of death and paralysis among the experimental animals and particularly because of the nine rabbits and one monkey which showed the histological lesions of encephalitis after being bitten by the mosquitoes, we feel that the work already done strongly indicates that the viruses used have been transmitted by *A. aegypti,* but that further investigation is required to furnish absolute proof."

In spite of the incomplete nature of the work at that time it was decided to publish the results in the hope that they might possibly throw some light on the source of the St. Louis epidemic of encephalitis, which was then at its height.

The experiments mentioned have been continued until the present, and while we still feel that some infectious agent may have been transmitted, we have not been able to obtain more definite evidence of the transmission of the herpetic viruses or to add anything that would confirm the conclusion drawn from the earlier experiments.

JAMES S. SIMMONS
RAYMOND A. KELSER
VIRGIL H. CORNELL

ARMY MEDICAL SCHOOL
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AN ENCYCLOPEDIA OF CHEMICAL REACTIONS

FOR more than five years, with the help of numerous graduate students, the author has been compiling data on the chemical properties of various elements and compounds, expressing the reactions by means of formula equations.

This work was started because of the lack of facilities for quickly locating reaction data. Hours and even days are consumed in searching the literature concerning information about some suspected reaction, and yet, when the search is completed, the probability is that authentic data upon this very reaction, published somewhere, have not been encountered.

The aim with this encyclopedia is to make it complete, so that it will include all accredited chemical literature in every language covering the inorganic field as well as a portion of the organic. However, the record for each reaction included in the encyclopedia is limited to the following concise entry: First, giving the symbol or formula of the reacting substance, alphabetically arranged. Second, in a marginal space to the left, is printed the symbol or formula of the reagent with which the substance undergoes a chemical change. Third, a brief statement of the conditions governing the reaction is included, which also names the products reacting and the products formed. Fourth, a balanced equation follows, expressing by symbols and formulas the complete reaction which may occur in one or more steps. Fifth, the name of the person or persons who made the original contributions upon this reaction, where and when these records were published, together with reference to some accessible abstract of the original.

The entire record for each reaction is placed upon a card 10 × 14 centimeters and sent to the central office for classification. All records are stored in card index files until a complete digest of all journals has been received, whereupon the problem of publication will arise.

The following entries show the plan of the completed work:

ALUMINUM

	Al
No. 74 c̄ $Ba(OH)_2$ (c̄ means with)	Barium aluminate is formed when a hot solution of barium hydroxide reacts with aluminum. $2Al + Ba(OH)_2 + 7H_2O =$ $Ba(AlO_2)_2 \cdot 5H_2O + 3H_2$ Allen & Rogers. Am. Chem. Jour. *24,* 304 (1900)
78 c̄ Fe	*Al* Iron-gray, dense, lance-shaped crystals are obtained when one part of iron and three parts of aluminum are melted together and crystallized from 2% hydrochloric acid. $3Al + Fe = FeAl_3$ Brunck. Ber. *34,* 2733 (1901)
580 c̄ Na_3AsO_4	$Al_2(SO_4)_3$ Aluminum arsenate is formed when aluminum sulfate reacts with sodium arsenate at 200° C. $Al_2(SO_4)_3 + 2Na_3AsO_4 =$ $2AlAsO_4 + (3Na_2SO_4)$ Coloriano. Compt. rend. *103,* 273 Ber. *19,* 660 (abs.) 1886.

CARBON

	C
59 c̄ H_2	Dry hydrogen passed over pure carbon mixed with 4% by weight of platinum sponge at a temperature of 1150°, the gas flowing at the rate of 1000 to 1100 cc per hour, produces methane. $C + 2H_2 = CH_4$ W. A. Bone & H. F. Coward, J. Chem. Soc. *97I,* 1219 (1910)
400 c̄ $I_2 + K_2S$	*KCN* A weak solution of iodine reacts with a mixture of potassium cyanide and potassium sulfide to give potassium thiocyanate. $KCN + I_2 + K_2S = KCNS + (2KI)$ W. I. Sharwood, J. Am. Chem. Soc. *19,* 430 (1897)

A more complete discussion of this project was published in the October, 1933, *Journal of Chemical*

Education (Vol. 10, page 614) of which reprints are available. The following periodicals have already published more or less extensive discussions of the encyclopedia and two others indicated their intention to do so: *Science News Letter,* News Edition of *Industrial and Engineering Chemistry, Journal of the Society of Chemical Industry,* London, *Journal of Canadian Chemistry and Metallurgy,* Toronto, and *Chemicky Obzor,* Prague.

The plan, as outlined, has the hearty endorsement of many leading chemists, and several persons in remote places have written for abstracting reservations. Five persons, excluding the author, are at present actively engaged in abstracting chemical literature for this encyclopedia. All of these, but one, are located outside of Morgantown. It is hoped that this number will rapidly increase as the project becomes known and its value realized. The success of the enterprise is only possible through wide publicity and the securing of ample abstracting service to make the work exhaustive and international in character.

When the compilation of all known reaction data is complete, the records will be published, and arrangements made to perpetuate the work by suitable supplements. Any one wishing to contribute to the success of this undertaking may obtain reprints and other particulars by addressing the author at Morgantown, W. Va.

C. A. JACOBSON

WEST VIRGINIA UNIVERSITY

THE PARSELENIC CIRCLE

THE "peculiar optical phenomenon" mentioned by Professor A. L. Fitch, of the University of Maine, in the April 27 issue of SCIENCE, was reported to me in correspondence from Professor M. F. Jordan, of the Department of Astronomy of the same institution, on February 28.

I am indebted to Dr. C. F. Brooks, of the Blue Hill Meteorological Observatory, for the information that the phenomena in question are evidently the relatively rare parselenic circle and parselenae of 22° and 46°. The circle is due to the reflection of moonlight from the vertical faces of ice crystals. It is, of course, distinct from the usual lunar halo and the parselenae due to diffraction. The optics and geometry of a parselenic circle, which corresponds to solar phenomenon, parhelic circle, is adequately presented in Humphreys' "Physics of the Air" (2d edition, 1929, pages 519–520).

As I have not yet seen a reply to Professor Fitch's inquiry for information, I am taking the liberty of communicating the above.

HARLAN T. STETSON

HARVARD UNIVERSITY

THE COST OF GERMAN PUBLICATIONS

THE note by Benjamin Harrow[1] regarding the cost of "Beilstein," Suppl. Vol. 13–14 is somewhat startling. The figure quoted—$60.55—is in terms of sixty-cent dollars, however. On the old basis the price would be $36.33, almost the same as Suppl. Vol. 11–12.

Perhaps a better illustration of Professor Harrow's point would be the *Zeitschrift für physikalische Chemie,* which, until 1924, published 3 to 4 volumes per year. From 1924 to 1928 the number was almost doubled. Then the journal was divided into two parts. Twenty-two volumes of Teil B, averaging 475 pages each, had appeared by September, 1933, while Teil A continued at the previous rate. The cost, in 1932, was the same for both parts, about $12.50 per volume.

Whether or not this has anything to do with reparations is problematical. May it not be one more result of the change in economic conditions? The swing from a system based on scarcity to one encumbered with abundance is certain to be far-reaching in its effects.

BYRON A. SOULE

UNIVERSITY OF MICHIGAN

SOCIETIES AND MEETINGS

THE MISSOURI ACADEMY OF SCIENCE

AN organization meeting, sponsored by a committee on arrangements appointed by Acting President Robbins, of the University of Missouri, was held at the University of Missouri, Columbia, Mo., on Friday, April 13, and Saturday, April 14. The attendance at this meeting was about 250. To this preliminary meeting were invited the science teachers of the approximately fifty universities, colleges and junior colleges of Missouri. The invitation to join the academy will be extended to others who should be interested, such as high-school teachers, physicians, scientists employed by industry or by the state, students, etc. Membership is open to any one interested, and the privilege of joining as a charter member is to be held open until the first annual meeting, which is to be held in the fall of 1934. The membership is already well above three hundred, and is increasing rapidly. Scientific clubs, schools and other organizations may affiliate with the academy by becoming institutional members.

[1] SCIENCE, 79: 410.

The program of the organization meeting was as follows:

Friday, April 13, 3:00 to 5:00 P. M.: Open house by scientific departments of University of Missouri, to welcome visitors and to discuss plans for formation of sections.

4:00 P. M.: Meeting of Temporary Council.

6:15 P. M.: Dinner, Tiger Hotel; Address of Welcome, Dean Wm. J. Robbins, Graduate School, University of Missouri, representing President Walter Williams.

8:00 P. M.: General Session:

(a) "Scientific Investigation as a State Asset," Professor Wm. J. Robbins (Botany), University of Missouri.

(b) "Cooperation in Scientific Research," Professor W. C. Curtis (Zoology), University of Missouri.

(c) "The Advent of Anesthesia," motion pictures, by courtesy of Mallinckrodt Chemical Works, St. Louis.

Saturday, April 14: General Session:

(a) "The Feeding of Nestling Birds," Professor Albert E. Shirling (Biology), Teachers College, Kansas City.

(b) "Properties of the Operator $\sqrt{-1}$ in Expressions for Power in Alternating Current Circuits," Dean A. S. Langsdorf, School of Engineering and Architecture, Washington University, St. Louis; Vice-president, Academy of Science of St. Louis.

(c) "The Scientific Basis of Low-cost Road Building," Dr. Hans F. Winterkorn, State Highway Department, Jefferson City, Mo.; formerly of Heidelberg University, Germany.

(d) "Is there a Calcium-Iron Antagonism between Soil and Wood?" Professor A. C. Magill (Chemistry), Southeast Missouri State Teachers College, Cape Girardeau, Mo.

(e) "Possible Functions and Activities of a Missouri Academy of Science," Professor John H. Harty (Physics), Northeast Missouri State Teachers College, Kirksville, Mo.

(f) Business Meeting:

(1) Adoption of Constitution and By-laws.

(2) Election of Officers.

The temporary council was made up of one representative from each school, selected by the school at the request of the committee on arrangements. At its meeting, the tentative constitution and by-laws were discussed and recommended for adoption as amended, together with other plans recommended for carrying them into effect. The final adoption is to occur at the first annual meeting, in the fall of 1934; a committee is to be formed which will receive suggestions and formulate any amendments which appear desirable. The amended constitution and by-laws were adopted, as recommended at the business meeting on Saturday morning.

The following officers were elected, to serve until the fall meeting: *President,* Dean A. S. Langsdorf, Washington University, St. Louis; *Vice-president,* Dr. F. T. H'Doubler, Springfield, Mo.; *Secretary,* Professor R. T. Dufford, University of Missouri, Columbia, Mo.; *Treasurer,* Professor R. A. Wells, Park College, Parkville, Mo.

The committee on arrangements consisted of Professors Louis Ingold (mathematics), *chairman;* Rudolf Bennitt (zoology), *secretary;* R. T. Dufford (physics); E. B. Branson (geology); W. C. Curtis (zoology); Addison Gulick (physiological chemistry); E. S. Haynes (astronomy); Wm. J. Robbins (botany); L. J. Stadler (field crops); A. E. Stearn (chemistry); W. A. Tarr (geology); C. J. Tucker (botany); Herman Schlundt (chemistry); G. E. Wahlin (mathematics). The subcommittee on program was headed by Professor Stearn; and the subcommittee on constitution and organization by Professor Dufford, who also served as temporary chairman of the committee on arrangements after Professor Ingold was compelled by ill health to take a leave of absence.

The committee on arrangements originally invited the Academy of Science of St. Louis to reorganize and expand into a state-wide organization; but this plan was found upon conference not to be feasible, on account of certain legal complications, and it was felt that it was undesirable for the St. Louis Academy to lose its identity. The St. Louis Academy therefore has cooperated in the formation of the Missouri Academy, and plans to become affiliated with it.

The Audubon Society of Missouri has already become affiliated with the academy, and will probably meet concurrently with it.

R. T. DUFFORD,
Secretary

THE IOWA ACADEMY OF SCIENCE

THE forty-eighth annual meeting of the Iowa Academy of Science was held at Drake University at Des Moines on April 20 and 21, with 258 members and visitors in registered attendance.

The presidential address, "The Future of Science," was presented by Dr. E. J. Cable, of Iowa State Teachers College. The remainder of the general meeting was devoted to a demonstration of the cathode ray oscillograph and its application to the study of acoustic phenomena. Drs. Joseph Tiffin and Don Lewis, of the department of psychology of the State University of Iowa, were in charge of the demonstration. The annual academy lecture was given by Dr. Julius Stieglitz, of the department of chemistry of the University of Chicago, on "Chemistry and Recent Progress in Medicine." Dr. C. P. Gillette, of the department of entomology of the Colorado State College at Fort Collins, was elected to honorary fellowship in the academy. The academy convened in eight sections for the presentation of 149 papers of special interest.

The following officers and section chairmen were

elected for the forthcoming year: *President,* Edward Bartow, State University of Iowa; *Vice-president,* R. E. Buchanan, Iowa State College; *Secretary-Treasurer* and *American Association for the Advancement of Science Representative,* J. C. Gilman, of Iowa State College; *Editor,* Mrs. F. W. Nichols, Ames; *Botany and bacteriology,* Louisa Sargent, Grinnell College; *chemistry, general and physical,* Ben H. Peterson, Coe College; *chemistry, organic and biological,* L. Chas. Raiford, State University of Iowa; *geology,* J. J. Runner, State University of Iowa; *mathematics,* M. E. Graber, Morningside College; *physics,* A. W. Meyer, Coe College; *psychology,* George D. Stoddard, State University of Iowa; *Zoology,* R. L. King, State University of Iowa.

J. C. GILMAN,
Secretary

THE KANSAS ACADEMY OF SCIENCE

THE sixty-sixth annual meeting of the Kansas Academy of Science was held at the Municipal University of Wichita and Wichita High School East from April 26 to 28. The program consisted of approximately 123 papers, given in the general sessions on the forenoons of April 27 and 28, and in sectional programs. The biology, chemistry, physics, psychology and Junior Academy sectional meetings were held in the afternoon of April 27. The entomology sectional program was held in the afternoon of April 28, under the auspices of the Kansas Entomological Society. The registered attendance at the programs was 218, and the total attendance at the sectional meetings was estimated at about 300. Four lectures were delivered during the course of the meetings. Mr. S. D. Flora, of the U. S. Weather Bureau, lectured on "Kansas Weather and its Effects on Crops"; Dr. F. L. Duley, of the U. S. Department of the Interior, gave a lecture on the "Kansas Soil Erosion Demonstration"; Dr. R. C. Moore, state geologist of Kansas, gave an illustrated lecture on "A Boat Trip through the Grand Canyon of Colorado." The presidential address was delivered at the annual banquet by Dr. J. Willard Hershey, of McPherson College. His subject was "The Historical Development of the Relationship of Gases to Animal Life."

The officers elected for 1934–35 are: *President,* Wm. H. Matthews, Kansas State Teachers College, Pittsburg; *First Vice-president,* E. A. Marten, University of Wichita, Wichita; *Second Vice-president,* W. J. Baumgartner, University of Kansas, Lawrence; *Secretary,* George E. Johnson, Kansas State College, Manhattan; *Treasurer,* Harvey A. Zinszer, Fort Hays Kansas State College, Hays. The following chairmen of sections were elected: *Biology,* L. E. Melchers, Kansas State College, Manhattan, and (*Vice-chairman*) C. E. Burt, Southwestern College, Winfield; *chemistry,* L. Oncley, Southwestern College, Winfield; *physics,* G. W. Maxwell, Kansas State College, Manhattan; *psychology,* Paul Murphy, Kansas State Teachers College, Pittsburg; *entomology,* H. R. Bryson, Kansas State College, Manhattan. Additional members of the executive council are: J. W. Hershey, McPherson College, McPherson; J. B. Stroud, Kansas State Teachers College, Emporia; R. H. Beamer, University of Kansas, Lawrence. Dr. F. C. Gates, of Kansas State College at Manhattan, was reappointed editor. The 1935 meeting will probably be held either at Topeka or Lawrence.

GEORGE E. JOHNSON,
Secretary

THE PENNSYLVANIA ACADEMY OF SCIENCE

THE tenth annual meeting of the Pennsylvania Academy of Science was held on March 30 and 31 at Albright College, Reading, Pa. Dr. John C. Johnson, State Teachers College, West Chester, Pennsylvania, presided. Sixty-four papers were read at the meeting. One hundred and ten members registered.

A junior academy was organized and sponsored by the senior organization. This young organization was well attended, and the program was enthusiastically received. Mr. Karl F. Oerlein, Upper Darby Senior High School, Upper Darby, Pa., was elected president of the junior body.

In the senior body the following officers were elected: *President,* Dr. S. H. Derickson, Lebanon Valley College, Annville, Pa.; *Vice-president,* Dr. Edgar T. Wherry, University of Pennsylvania, Philadelphia, Pa.; *Treasurer,* Dr. H. W. Thurston, Pennsylvania State College, State College, Pa.; *Secretary,* Dr. T. L. Guyton, Department of Agriculture, Harrisburg, Pa.; *Assistant secretary,* Dr. V. Earl Light, Lebanon Valley College, Annville, Pa.; *Editor,* Mr. R. W. Stone, Pennsylvania Geological Survey, Harrisburg, Pa.

The place for the summer meeting was fixed for the Mount Gretna district in Lebanon County.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

AVIAN MALARIAL INFECTIONS AS CLASSROOM MATERIAL[1]

IT is often a problem to secure suitable material for the study of important types of parasites in courses in zoology, protozoology and parasitology. The malarial parasites illustrate this, for although human malaria is a disease of great importance, it

[1] From the Department of Zoology, Syracuse University.

nevertheless has a relatively restricted distribution. That the malarial parasites of birds offer an excellent and easily available substitute is not generally known.

Infected birds may be secured almost anywhere. Most small birds are probably susceptible, but of all the common types English sparrows are perhaps the most easily caught and kept in the laboratory. For methods of trapping Farmers' Bulletin No. 493[2] may be consulted. Diagnosis of malarial infection can be made either by finding the parasites in stained blood smears, or by subinoculation of blood into clean birds. When the incidence of infection is low, as seems usually to be the case, chronic infections may be often detected by dividing the birds into pairs, and then injecting at least 300 cmm of blood from each bird into the other, together with enough isotonic citrated salt solution to prevent clotting. Full directions for doing this may be found in an article by the author cited below.[3] Even the larger birds may be infected. The author has found the common starling (*Sturnus vulgaris*) and the purple grackle (*Quiscalus quiscula*) occasionally infected with a strain resembling *Plasmodium praecox*, although these birds have apparently not previously been reported as hosts.[4]

Malarial infections in birds may be used in a number of ways. Since they undergo exactly the same stages as the human malarial parasites they furnish excellent material for life-history studies, and *Plasmodium cathemerium*, with a clearly defined asexual cycle of twenty-four hours, illustrates periodicity very well. Since three of the six (or seven) species of avian malaria differ among themselves very much as the human malarias do, they may also be used to illustrate the specific differences of the latter. Descriptions of all these species are given in the papers cited below.[5, 6, 7, 8, 9]

One of the most interesting phenomena in all parasitology is the formation of microgametes from microgametocytes, and this can be very readily observed if a drop of heavily infected blood is mixed with a little physiological saline solution and watched for fifteen or twenty minutes under the oil immersion.

For the study of the course and pathology of a malarial infection canaries are very suitable, since they are virtually always free from such infection to begin with. The effect of quinine and plasmochin treatment is also interesting to follow, and the protection which a chronic infection confers against superinfection is easily demonstrated. In all these respects malarial infection in birds closely resembles that in man.

There is also the further advantage that study of the avian malarias might interest more students in using them as research material, if it could be widely carried out, and that as a result our knowledge of both bird and human malaria might be increased.

REGINALD D. MANWELL

SYRACUSE UNIVERSITY

DEVICE FOR CONSTANT FLOW OF LIQUIDS

RECENTLY I found it necessary to evolve some sort of mechanism which would give me a constant flow of liquid from a container.

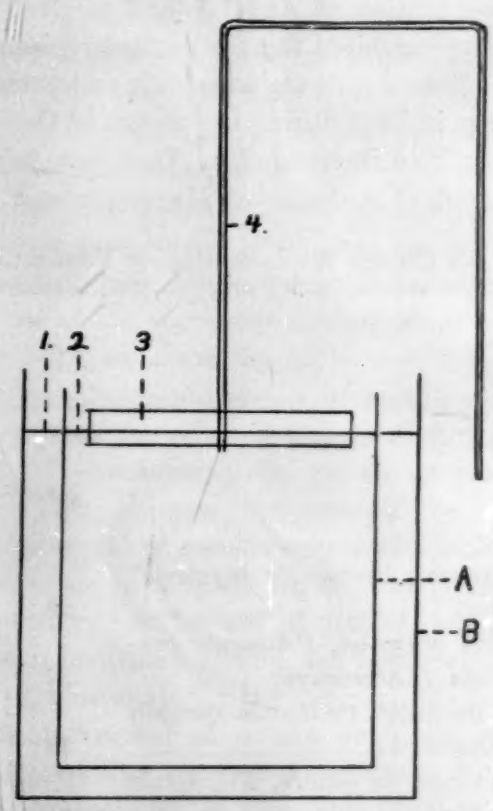

FIG. 1. A, container; B, container; 1, surface of water in container (B); 2, surface of water in container (A); 3, float; 4, siphon.

[2] Ned Dearborn, "The English Sparrow as a Pest," Farmers' Bulletin No. 493, Government Printing Office, 1927.

[3] Reginald D. Manwell, "Experiments in Bird Malaria," Chap. 37, "Problems and Methods of Research in Protozoology" (edited by Hegner and Andrews), Macmillan, 1930.

[4] C. M. Wenyon, "Protozoology," Wm. Wood & Co., 1926.

[5] Ed. et Et. Sergent and A. Catanei, "Sur un parasite nouveau du paludisme des oiseaux," *Comptes rendus de l'Acad. des Sci.*, 186: 809–810, 1928.

[6] Clay G. Huff, "*Plasmodium elongatum*, n. sp., an Avian Malarial Organism with an Elongate Gametocyte," *Amer. Jour. Hyg.*, 11: 385–391, 1930.

[7] W. Kikuth, "Immunobiologische und chemotherapeutische Studien an verschiedenen Stämmen von Vogelmalaria," *Zentralbl. f. Bakt.*, 121: 401–409, 1931.

[8] F. G. Novy and W. J. MacNeal, "Trypanosomes and Bird Malaria," *Amer. Med.*, 8: 932–934, 1904.

[9] Paul F. Russell, "Avian Malaria Studies, *V. Plasmodium capistrani*, n. sp., an Avian Malarial Parasite of the Philippines," *Phil. Jour. Sci.*, 48: 269–287, 1932.

The mechanism naturally had to get around the fact that as liquid flows from a container the head is diminished and consequently the rate of flow decreased.

The use of a float valve in keeping a constant head was not satisfactory, so the siphon principle was employed and later modified to the form described as follows:

(1) Secure a container (A) of fairly light material which is large enough to hold the liquid that is being used.

(2) Fashion some sort of float which will rest on the surface of the liquid in the container. It must be a flat float which will not turn over.

(3) Run the short arm of a U-shaped siphon tube through the center of the float so that one end of the tube is submerged and the other (lower) end is outside the container. The height of the U must be great enough so that as the liquid is siphoned off and the float sinks the tube will not strike the lip of the container.

(4) The arrangement above will give a fairly even flow, providing the depth of the liquid is not great, but in order to give an unvarying flow the container of liquid (A) must be floated in a second container (B), so that as the liquid is siphoned from (A) it decreases the weight of (A) and causes it to rise in the water in container (B). Thus the two ends of the siphon are kept at exactly the same level throughout the process.

The apparatus has been described very roughly, and it is necessary to watch the balance and points of contact so that the rising and dropping of the floating bodies is not hindered.

J. H. WALES

STANFORD UNIVERSITY

SPECIAL ARTICLES

LATENT PSITTACOSIS AND SALMONELLA PSITTACOSIS INFECTION IN SOUTH AMERICAN PARROTLETS AND CONURES[1]

DURING the month of May, 1933, the United States Quarantine Station at Angel Island received a shipment of tropical birds for the customary isolation of 2 weeks. The parrotlets, paroquets and conures had been caught in 1932 during the month of October 300 miles south from Barranquilla. They were held at the establishment of a dealer at Magangue and then at Port Colombia, from where they were shipped on April 20, 1933. Through the courtesy of Dr. H. A. Spencer, medical officer in charge of the United States Public Health Quarantine Station, 52 of the psittacine birds, which died during the quarantine period from May 11 to June 13, were sent to the laboratory for study. Complete autopsies, cultural examinations and mouse inoculations with the organ suspensions were made on every bird. Since the spleens and livers of 2 spectacled parrotlets produced in mice sterile lesions suggestive of psittacosis with positive findings of L. C. L. bodies, the State Department of Public Health arranged with the United States Public

[1] From the George Williams Hooper Foundation, University of California, San Francisco, California.

TABLE I

	No.	Sex		Splenic tumor and liver necroses	Psittacosis virus	Salmonella "aertryck"
		M.	F.			
Tovi paroquet, *Brotogeris jugularis** (Müller)	39	15	24	4	—	4
Spectacled parrotlet, *Psittacula conspicillata* (Lafresnaye)	37	26	11	4	2	4
Spengel parrotlet, *Psittacula spengeli* (Hartlaub)	16	9	7	3	4 = (25 per cent.)	—
Petz paroquet or conure, *Eupsittula canicularis* (Linnaeus)	29	12	17	15	—	5
Brown-throated paroquet, *Eupsittula pertinax aeruginosus* (Linnaeus)	11	6	5	3	2	3
Totals	132	68	64	29	8 = 6 per cent.	16 = 12 per cent.

* Determined by Professor J. Grinnell from Ridgway's "Birds of North and Middle America," Part VII, 1916.

Health Service and the shipper for the destruction of the paroquets and parrotlets. A total of 132 birds, including those which had succumbed during the quarantine period, has been examined. The results are summarized in Table I.

In general, the data confirm previous observations that tropical psittacine birds are not infrequently carriers of Salmonella organisms, which are related biochemically to the *S. psittacosis*. The 19 different strains, which have been isolated either directly from the enlarged spleens, livers and heart blood, or indirectly from the mice inoculated with the organs, are, serologically, closely related to the *S. aertryck* but consist of a number of diphasic variants. The parrotlets, paroquets and conures, infected with these bacteria, had either succumbed to the infection or were carriers. When the former was the case, the intestinal tube was definitely inflamed, the anus soiled with greenish material and the spleen enlarged and soft. The carriers were recognized by the atrophic pectoral muscles, the large spleen and the voluminous fatty liver diffusely studded with fine grayish necroses. Aside from these usual lesions, 2 Tovi paroquets presented bilateral pneumonic patches. Microscopically, the anatomical changes are identical with those described for avian salmonellosis by J. R. Meyer.[2] Acidophilic intranuclear inclusions characteristic of the Brazilian virus have not been observed. The Salmonella strains exhibited their usual host range of pathogenicity. They infect, with ease, shell parrakeets and ricebirds per os. If accidentally encountered by the inexperienced, the lesions in the birds may lead to confusion, although the cultural examination with brilliant green media will reveal the specific cause without difficulty.

More important is the demonstration of the psittacosis virus in the spleen and liver of 4 immature Spengels, 2 spectacled parrotlets and 2 brown-throated paroquets. Fatal infections were seen in 2 *Ps. spengeli* and 1 *Ps. conspicillata*. The cadavers were emaciated, the tail feathers soiled, the spleens slightly enlarged (3×3, 5×5 mm), the fatty livers showed a few necrotic areas (readily distinguished from the Salmonella lesions) and light grayish kidneys. A latent infection was indicated in the 5 other parrotlets and paroquets by a splenic tumor and a yellowish liver. Cultures prepared from the heart blood and organ suspensions remained sterile. Mice injected intraperitoneally with 1 cc of a broth suspension of the organs became ill in from 7 to 14 days. When death ensued, they showed the usual lesions encountered in psittacosis infections of these rodents. L. C. L. bodies were readily demonstrated in the impression preparations. The specificity of the infective agent was proven by 29 passages in 36 weeks. Its filterability and the pathogenicity for rice-birds and shell parrakeets were established by injection, by exposure and by the guinea pig skin test. Preliminary cross immunity tests indicate a close relationship, if not identity, with the California virus. It is regrettable that the actual number of latent infections within the group of 132 birds could not have been determined with certainty. However, it was impractical to filter all the organ suspensions of the parrotlets, which had lesions suggestive of psittacosis but were heavily invaded by *S. psittacosis*. Thus, the possibility must be kept in mind that mixed infections of the virus with bacteria may have existed in the flock. Filtrates of several livers, which presented lesions suggestive of old necroses, were tested on shell parrakeets in order to demonstrate the Brazilian virus of Pacheco, Bier and Meyer,[3] which is species specific and is not transferable to mice. The results were negative. Two representatives each of the 5 species of Psittacidae, belonging to the same shipment, were kept under observation for several weeks. They were then injected intramuscularly with a very active California passage virus. The parrotlets and Petz conures died within from 10 to 26 days with the lesions and L. C. L. findings of acute psittacosis, while the Tovi and brown-throated paroquets remained well despite repeated injections of virus. Susceptibility tests on a limited number of birds, as a rule, remain inconclusive. One may, therefore, merely conclude that the highly treasured Spengel's and spectacled parrotlets are quite susceptible and, consequently, may sometimes become spontaneous carriers of the psittacosis virus, particularly when they are immature. In this respect, they behave like the budgerigars. The resistance of the paroquets against an acute infection was anticipated, since the birds were mature. It is well known from previous studies and others to be reported that the adult population of a susceptible species of psittacine birds, grown or reared in an endemic area, is largely an immune one.

The observations conclusively establish the existence of psittacosis in tropical birds from Colombia and, consequently, justifies the protective measures which have been instituted against the importation of these pets. Unfortunately, the origin of the disease, whether contracted in nature or in the bird stores of Barranquilla, remains undetermined. It seems reasonable, however, in the light of other studies, to assume that avian psittacosis is widely distributed among South American parrots, parrotlets and paroquets. Furthermore, there is no doubt that in case conditions favorable for its development exist, and

[2] *Arch. Inst. Biol. São Paulo*, 1931, 4: 25, 1931.

[3] *Memonas do Instituto Oswaldo Cruz*, 26: 169, 1932. Th. M. Rivers and F. F. Schwentker, *Jour. Exper. Med.*, 55: 911, 1932.

where there are many acute fatal avian infections, the disease may be transferred to man and may be spread to other cage birds in pet shops or bird establishments.

K. F. MEYER
B. EDDIE

POSSIBLE CHEMICAL NATURE OF TOBACCO MOSAIC VIRUS[1]

UNDER the above title Barton-Wright and McBain[2] make the interesting announcement that virus fractions have been obtained which were free of nitrogen.

Lojkin and Vinson[3] reported the inactivation of purified virus preparations by trypsin. Caldwell[4] announced that this inactivation by trypsin is only apparent; for upon heating the trypsin digest to a suitable temperature, the activity of the virus was restored. Our results during the past year fully agree with Caldwell's announcement. Since the protein-splitting enzymes do not readily attack this virus, it would seem possible that it might be non-nitrogenous in character; hence the announcement of Barton-Wright and McBain is in keeping with this possibility.

Barton-Wright and McBain precipitated the virus from juice of diseased plants with a solution of lead acetate; removed the virus from this precipitate with neutral phosphate solution, then precipitated the virus from the neutral phosphate solution with safranin. The safranin-virus precipitate was suspended in water and the safranin removed with normal amyl alcohol. The decolorized aqueous phase thus obtained was infectious and contained no nitrogen.

Under our conditions and using plants of *Nicotiana Tabacum,* var. Turkish, I still find nitrogen present in infectious preparations obtained as described above. The nitrogen content, however, is not high, especially when the diseased plants have been grown during the short gloomy days of midwinter. Also, in extracting the safranin with normal amyl alcohol, emulsions tend to form and the undecomposed safranin precipitate tends to concentrate in the surface films. As the emulsion breaks, the safranin precipitate collects at the amyl alcohol-water interface. In case this interfacial material is not allowed to remain with the aqueous phase after each extraction, the nitrogen content of the final virus fraction may be very low, indeed, and the results indicate that the infective power was also low. When, however, the leaves of 10 plants were rubbed with a cloth dipped in the virus preparation, 100 per cent. infection was produced. Starting with 500 cc of juice from diseased plants, carrying through and running the Kjeldahl determination on the entire sample (except for an aliquot of 20 cc removed for inoculating plants and for pH determinations), the final virus fraction may contain only one or two milligrams of nitrogen. When, however, care was exercised to retain the interfacial layer with the aqueous phase after each extraction until decomposition was complete and there was no further interfacial layer, the nitrogen content of the final virus fraction from 500 cc of juice was found to vary from 8 to 24 milligrams in 8 experiments. The number of plants diseased out of one hundred plants inoculated with the last mentioned preparation was much greater than in the case of inoculations with those preparations obtained by discarding the interfacial layer each time.

Vinson and Petre[5] have already reported that a suspension of the washed interfacial layer is infectious. Had nitrogen determinations been made on the ordinary sample derived from 25 cc or even 100 cc of juice, it would have been impossible to detect nitrogen in some of the above fractions by the ordinary Kjeldahl method. It is also interesting to note that when Lloyd's reagent[6] was employed to decompose the safranin precipitate the nitrogen content and infective power of the final fraction were increased. This greater infective power should not be taken, however, as an absolute indication of greater virus content, since the fraction obtained by the use of normal amyl alcohol and that obtained by the use of Lloyd's reagent passed through different procedures and hence were not comparable.

Barton-Wright and McBain also state that their fractions, obtained by the procedure described above, were free of phosphate. Again, under our conditions, and starting with 500 cc of juice from diseased Turkish tobacco plants, the final infectious virus fraction obtained by the method of Barton-Wright and McBain contained phosphorus. Phosphorus was present to the extent of about one half milligram even when the safranin precipitate had been washed 3 times with a concentration of safranin (200 cc of a 1 per cent. aqueous solution added to 500 cc of redistilled water) equal to that in the mother liquor from the safranin precipitate, then washed once with redistilled water. It would seem very difficult to obtain a safranin precipitate from such a highly concentrated

[1] Contribution from the Department of Horticulture, Missouri Agricultural Experiment Station. Journal Series No. 380.

[2] E. Barton-Wright and A. M. McBain, "Possible Chemical Nature of Tobacco Mosaic Virus," *Nature,* 132: 1003, December 30, 1933.

[3] Mary Lojkin and C. G. Vinson, "Effect of Enzymes upon the Infectivity of the Virus of Tobacco Mosaic," *Contr. Boyce Thompson Institute,* 3: 147–162, 1931.

[4] John Caldwell. *Ann. of Appl. Biol.,* 20: 111, February, 1933.

[5] C. G. Vinson and A. W. Petre, "Mosaic Disease of Tobacco," *Contr. Boyce Thompson Institute,* 1: 479–503, 1929.

[6] C. G. Vinson, "Mosaic Disease of Tobacco. V. Decomposition of the Safranin-Virus Precipitate," *Phytopathology,* 22: 965–975, December, 1932.

phosphate solution without carrying along phosphate in some manner.

Barton-Wright and McBain also announce in the same article that a crystalline product has been obtained which was free of nitrogen, but contained phosphorus and active virus. In 1928, I obtained several crystalline products,[7] one of which, for instance, was recrystallized three times. The recrystallized product contained virus, as its solutions were infectious, but 358 milligrams of the air-dry crystals contained no Kjeldahl nitrogen. Qualitative tests for reduced sulfur, sulfate, phosphate and chloride were negative. The product charred on heating and contained calcium. It was soon learned, however, that the mother liquor from which the original crystalline product was obtained seemed to contain the major portion of the infectious agent; consequently, the failure to find nitrogen in the sample taken was without particular significance. A dilution of 1 in 100 of our purified virus fractions would make the detection of nitrogen uncertain by the ordinary Kjeldahl method, using ordinary samples.

The virus fraction in most of our preparations is readily precipitated by means of a small amount of $N/_1$ aluminum sulfate solution. This did not hold true for the virus preparations obtained by the amyl alcohol procedure.

Under our conditions purified virus preparations which seemed to contain the major portion of the original virus have not yet been obtained free of nitrogen. This is not stated, however, as argument against the possibility of nitrogen-free preparations having been obtained by others under their conditions.

C. G. VINSON

UNIVERSITY OF MISSOURI

SOIL MINERALS AS A CHECK ON THE LOCATION OF THE WISCONSIN-ILLINOIAN DRIFT BOUNDARY IN NORTH CENTRAL OHIO

As a part of a study of the Pleistocene geology of the region in and around the reentrant angle in the glacial boundary in northeast central Ohio, the outer limits of the Wisconsin and of the Illinoian drift sheets were mapped with considerable care. Fig. 1 shows the location of these boundaries in Knox, Coshocton, Richland and Ashland counties. The Wisconsin boundary farther west, where no older drift lies beyond the younger, has already been described in detail.[1]

The problem of mapping the Wisconsin boundary, where Illinoian drift lies beyond, was more difficult than that of mapping the Wisconsin boundary, where no early drift lies beyond. The boundary between the Wisconsin and Illinoian drifts shown in Fig. 1,[2] was determined by a study of the varying amount of erosion, degree of drainage integration, depth of leaching, et cetera. Its position will be described in detail elsewhere. Incident to a study of the minerals in Wisconsin and Illinoian drifts,[3] it was discovered that the minerals in the soil of the two drifts had different characters. The location of the boundary between the two drifts was then checked by a study of the minerals in the soil. It is the purpose of this note to describe the results so far attained in mapping a boundary between drifts of two ages by means of a study of the soil minerals.

FIG. 1. Map of a portion of north central Ohio, showing areas covered by Wisconsin and Illinoian drift and location of soil samples taken.

Samples of surface soil from reasonably flat areas were collected for laboratory study. Samples were prepared for study as follows: About 25 grams were separated by washing and decantation into sand, silt and clay fractions. After just enough water had been added to wet the sample, it was ground for a few minutes with the ball of the thumb or with the index finger against the inside of a 150 cc beaker. The beaker was then almost filled with water and the silt and clay decanted from the sand. Decantation was repeated until the sand was free from silt and clay. The clay was decanted from the silt and the

[7] C. G. Vinson and A. W. Petre, "Mosaic Disease of Tobacco. II. Activity of the Virus Precipitated by Lead Acetate," *Contr. Boyce Thompson Institute*, 3: 142, 1931.

[1] G. W. White, "Glaciation of Northwestern Holmes County, Ohio," *Ohio Journal Sci.*, 31: pp. 429–53, 1931; "An Area of Glacier Stagnation in Ohio," *Jour. Geol.*, 40: pp. 238–258, 1932.

[2] The names of the townships within the counties shown may be determined from the Geologic Map of Ohio, published by the Geological Survey of Ohio.

[3] The writer is indebted to Professor William J. McCaughey, of the Ohio State University, for advice on methods of separation and examination of soil minerals.

silt and clay saved for possible later examination. The sand was separated into fractions with standard screens having openings of 1, 1/2, 1/4, 1/8, 1/16, 1/32 mm. The 1/2 to 1/4 and the 1/4 to 1/8 mm fractions were found to be best suited for study. These fractions were examined under a binocular microscope in reflected light and under a petrographic microscope in transmitted light.

The Wisconsin sand is fresh appearing and consists dominantly of quartz with small proportions of feldspar and hornblende, of occasional grains of heavy minerals and of a very few rounded iron oxide "pellets." Commonly, several grains of feldspar and hornblende are present in any microscopic field. The average mineral content of several samples is shown in Fig. 2. Many feldspar grains retain their cleavage

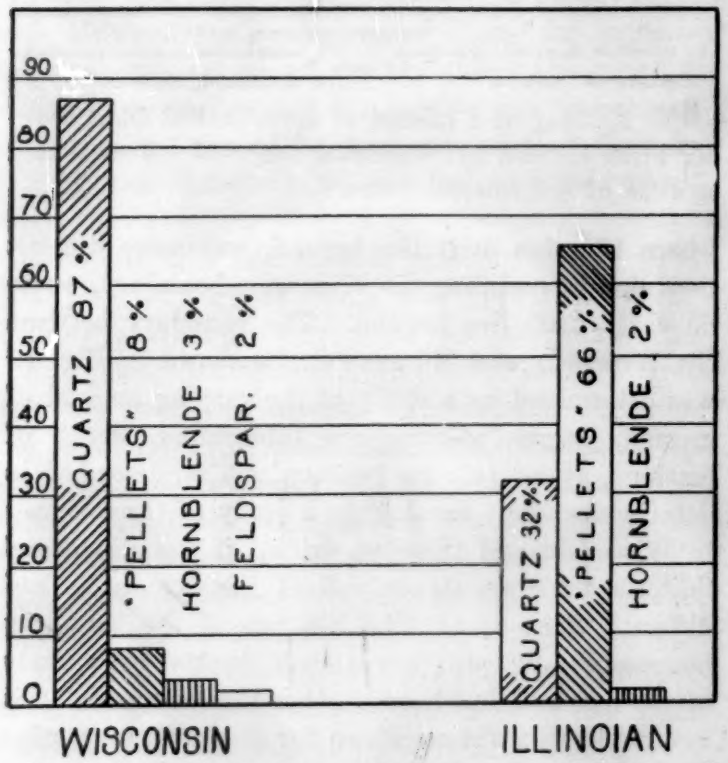

FIG. 2. Chart showing average mineral composition of $\frac{1}{4}$–$\frac{1}{8}$ mm grains washed from soils derived from Wisconsin and Illinoian till.

faces and most grains are very fresh looking. Many grains are only slightly turbid in transmitted light. The hornblende is rarely rusty and has cleavage faces usually as bright and shiny as those of freshly broken material.

The Illinoian sand is weathered and brown and in the washed samples is easily distinguished megascopically from the Wisconsin sand. Under the binocular the sand is seen to consist of about one third quartz and of about two thirds iron oxide "pellets." The average mineral content of Illinoian material is shown in comparison with that of Wisconsin material in Fig. 2. The quartz is sometimes stained with iron oxide. Feldspar is so rare that several microscopic fields may have to be examined to find one grain. The feldspar grains are rounded and pitted, and show no distinct cleavage faces. Most grains are very turbid in transmitted light. The hornblende grains are generally rusted and dull.

The iron oxide "pellets" were examined under the petrographic microscope, both in thin sections and as crushed fragments. The "pellets" are of two types: (1) More than 90 per cent. consist of angular grains of quartz silt in a matrix of brownish iron oxide. (2) A few pellets are small grains of quartz surrounded by a thick coating of iron oxide at least as thick as the radius of the core of quartz. Most of the "pellets" are spherical. Most are quite hard, so that considerable pressure is necessary to crush them —as much in some cases as is necessary to crush a feldspar grain. Their hardness is such that they offer little difficulty in the preparation of thin sections when embedded in balsam.

Surface samples so far studied were collected from the localities indicated in Fig. 1. These samples were definitely either of one type or of the other. The boundary between the two types of samples coincided with the boundary between the Wisconsin and Illinoian previously mapped by the use of other criteria. On either side of the boundary, samples collected within 200 yards of each other were as clearly different from each other as samples collected miles from the boundary.

After this method of distinguishing between Wisconsin and Illinoian drift appeared to be valid, based on examination of samples taken several miles from the boundary and of samples on either side of the boundary where it was quite definite, this method was then used in mapping the Wisconsin boundary in the "Davis Basin," just west of the Ashland-Richland county line, in sections 11, 12, 13 and 14, Worthington Township, Richland County, where the Illinoian drift border passes under the Wisconsin drift (Fig. 1). Using other criteria, the location of the Wisconsin boundary across the "Davis Basin" could not be determined more accurately than being within a belt from 1/2 to 1 mile in width because of puzzling topographic conditions and disturbing variations in depth of leaching. After examination of mineral grains washed from soil samples taken in the basin, a boundary was clearly indicated which is believed to be accurate within 100 yards.

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